

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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C.P.

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10 Title: Phase-Locked Loop Having Phase Detector Error Signal Reshaping  
and Method Thereof

15 To: Commissioner for Patents  
P.O. BOX 1450  
Alexandria, VA 22313-1450

Subject: Response to the Office action dated 05/08/2003

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## INTRODUCTORY COMMENTS

The application is amended in an effort to overcome the objections and rejections made by the examiner. Claims 1, 3, 5, 9, 11, and 12 are amended, claims 7 and 16-20  
5 are cancelled, and claims 21-38 are added. No new matter is introduced by these amendments. Consideration of all amendments is politely requested.

## AMENDMENTS TO THE CLAIMS

1. (currently amended) A phase-locked loop comprising:

5 a phase detector for receiving an input signal and a feedback signal, and for outputting a phase error signal based on a phase difference between the input signal the feedback signal;

a signal pulse reshaper connected to the phase detector for reshaping the phase error signal by increasing or decreasing a width of a pulse of the phase error signal;

10 a charge pump connected to the signal pulse reshaper for receiving the reshaped or unreshaped phase error signal from the signal pulse reshaper and for outputting a charge pump signal;

a low pass filter connected to the charge pump for receiving the charge pump signal and outputting an output signal; and

15 a voltage-controlled oscillator connected between the low pass filter and the phase detector for receiving the output signal and for outputting a corresponding oscillation signal, wherein the feedback signal inputted into the phase detector is generated from the oscillation signal;

20 wherein the unreshaped phase error signal causes the charge pump to output a charge pump signal that changes the frequency of the feedback signal to match the frequency of the input signal, and the reshaped phase error signal causes the charge pump to output a charge pump signal that synchronizes the output signal with a target frequency.

25 2. (original) The phase-locked loop of claim 1 further comprising a frequency detector connected between the voltage-controlled oscillator and the charge pump for receiving the input signal and the feedback signal and for outputting a frequency difference signal to the charge pump.

30 3. (currently amended) The phase-locked loop of claim 1 wherein when the frequency of the output signal is in a lower range that is lower than the target frequency, the